

Jalgaon Sorghum firstly may maintain its yielding capacity† under our local soil and climate conditions, secondly that transplanting increases the yield of grain.

Allowing for paths and computing one acre at 40,000 feet, we should come to the following figures:

Transplanted plot: 280 square feet 15 lbs. 5 ozs. of dry grain.

Sown plot: 280 square feet 5 lbs.

One acre—714 pounds dry grain.

In the light of the foregoing averages for India viz. 500 to 900 lb. per acre, the figure for the transplanted plot appears absolutely abnormal; but, then, so was the size and weight of the panicles. One, among the number, weighing $3\frac{1}{4}$ ounces was found after picking the seeds one by one, to give $2\frac{1}{4}$ ounces of seeds, the rachis weighing one ounce.

E. H. MATHIEU.

A NOTE UPON PLANTS GROWN FOR BLUE DYES IN THE NORTH OF THE MALAY PENINSULA.

Within the last few years a little information has reached the Botanic Gardens upon plants raised in the north of the Peninsula for the sake of the blue dye that they yield; and three have been submitted for determination being:—

Indigofera suffruticosa, Mill.

Strobilanthes flaccidifolius, Nees, and

Marsdenia tinctoria, R. Br.

The first two of the three were sent from the state of Kelantan by Mr. R. J. Farrer, the latter two of the three from Upper Perak by Captain H. Berkeley. All three are well known as dye-plants; but as a dyeing industry flickers only within the Peninsula, it is interesting to ask what influence may have brought them into cultivation here.

Indigo cultivation has a long and a very complicated history; and the above named species of *Indigofera* is one only of half a dozen grown in different parts of the world. Indigo, almost certainly imported, was used as a dye in ancient Egypt: for mummy clothes of 2300 B.C. have been found dyed with it. It was prepared in ancient India, and finds mention in the sanskrit writings of about the same period. It was an expensive import of Rome at the commencement of the Christian era, coming from India via Alexandria, and bearing the name "indicum" from its source. It is extremely probable that Ancient Egypt also got its indigo from India.

† Misfortune attended an attempt to repeat this experiment; for rain fell heavily at harvest destroying the grain; and it is feared that the climate of Singapore is too unreliable for the crop; but in the north of the Peninsula if maturity be aimed at in February the chances of a return would appear good.
I. H. BURKILL.

With the sacking of Rome the use of indigo became lost to Europe; but without doubt India still grew it: and it can be shown that the Arabs who brought paper making into Europe and the sugar-cane, brought a knowledge of indigo cultivation at least into Asia minor. Europe, as it had always done in chief part, meanwhile went on using woad for its blue dye; but after a time a little indigo (now of Arabian origin) filtered afresh along the Mediterranean to Italy. And later when Vasco da Gama in 1516 had opened the way to India, the portuguese east indiamen began to bring indian indigo to the great mart of Lisbon. After the Great Armada had been destroyed, and with the ascendancy of the Dutch which followed, the cultivation of indigo in Malabar and the Malayan region was encouraged; for trade in it was very remunerative, as for instance, in 1631 when five dutch merchant vessels brought from Batavia into Amsterdam 285 tons of indigo then worth as much as five tons of gold.

From this period dates the eclipse of woad in Europe, but not its extinction: for woad is still used to induce the dyeing with indigo.

Indigo growing even invaded Europe: for a century and more back its cultivation was tried with success in various places, *e.g.* Malta, Sicily, Southern Italy and Spain; and with passable results even in Southern France (department of Vaucluse): but it is certainly not a plant that can be grown economically now that the value it had has dropped to one quarter.

At least three species of *Indigofera* contributed to the early supply; for, while Surat indigo was derived from the cultivation of *Indigofera articulata*., Gonan, the cultivation of indigo in South India would seem to have been of *Indigofera tinctoria*, Linn.: and in the Malay region the Dutch met with *I. sumatrana*, Gaertn., and they interchanged the two latter: they brought *I. tinctoria* to Malaya: while they took *I. sumatrana* to India: and *I. sumatrana* proving the better, they adopted it in both places. They spread it through Malabar and Madras; and when under the rule of the East India Company indigo began to be produced in Bengal, *I. sumatrana* was the species brought into cultivation around Calcutta, whence its cultivation was taken north to Rajshahi and then west to Behar, it becoming the plant of the well known Behar indigo industry. From this beginning for three quarters of a century Bengal went on cultivating the one species, *I. sumatrana*, which the Dutch had brought into southern India so long before.

Europe, however did not draw anything like the whole of its requirements of the dye from the East; but tapped (1) the West Indies and southern of the United States, where at the end of the 17th century *I. tinctoria* was the indigo grown, and (2) Brazil where an American species *I. suffruticosa*, Mill. (*I. Anil*, Linn.) was brought into cultivation. From the New World the latter found its way into the Malay region, and as the Dutch believed it better than *I. sumatrana* they changed their crop in Java; at the

same time this American *I. suffruticosa* got a footing upon the south coasts of China along with *I. tinctoria*, became also a crop of the neighbourhood of Manila, and would seem to have been the indigo grown by Chinese a little later upon the out-kirts of Singapore. And therefore to this date with this, the East had put four species under contribution.

The Arabs when they started the cultivation of indigo in Arabia took for their crop *I. articulata*—the species which supplied Surat indigo; and they established it also in Egypt; but this particular species did not spread to the upper Nile, where *I. arrecta*, Hochst., was or became grown. It may be that the origin of indigo-growing in Africa came from the Arabs; and in any case it is exceedingly probable that ancient Egypt drew its indigo from India and not from the Soudan; but the cultivation of *I. arrecta* has become very wide in Africa; and about 1860 the Dutch got possession of it for Java where it displaced *I. suffruticosa*, but did not hold its ground for long as a second American species. *I. guatemalensis*, Moc. and Sessé, came into favour about 1870, only to be ousted, imperfectly however, by *I. arrecta* coming in again as a consequence of changed methods.

These alterations of the species in vogue in Java, did not in Malaya extend beyond the Dutch Indies; but in India the Behar industry slowly began to follow suite in adopting *I. arrecta* under the name of "Java-Natal indigo."

Singapore gave up indigo-production in the seventies: the Philippine islands lost their export in the nineties; but China remains growing over a limited area on its south-east coasts for its own internal consumption, probably both *I. tinctoria* and *I. suffruticosa*. The last named is the species of *Indigofera* cultivated in Kelantan.

The indigo dye manufactured for the Chinese local markets is sold in paste; and such was that from this species sent by Mr. Farrer.

It is not possible to see a future in the industry, especially as the batik workers in Java who consume a considerable quantity of indigo appear to find the artificial more to their liking; and moreover Kelantan is backward in growing a species now twice superseded in Java—growing it moreover when the war had curtailed the supplies of artificial indigo.

The enormous demand for a blue dye in China is met but in part by the use of indigo; and indigo cultivation seems only to have got a hold in the south-east of the country; elsewhere the blue dye comes from *Isatis indigotica*, Fortune, the Chinese woad, from *Strobilanthes flaccidifolius*, Nees (*Ruellia indigotica*, Fortune), from *Peristrophe tinctoria*, Nees, and from *Polygonum tinctorium*, Lour. The second of these is the second of the dyes from the north of the Malay Peninsula with which we are dealing.

Strobilanthes flaccidifolius has never found a place in cultivation outside southern China, Indo-china and the adjoining moun-

tainous parts of India; but within its area it has quite an importance. It is for instance said in southern China to be preferred to indigo, both in the vat, and because instead of being a biennial it persists over several years and can be cut repeatedly. It is probably unsuited to the open plains where indigo is grown in India; and no one has had occasion to try growing it upon a plantation scale.

Obviously the Kelantan and Perak cultivation of this species is to be regarded as the southern limit of the range of this interesting crop. It would not be new in those parts, but like the Kedah rice fields, probably established from at any rate the time several centuries back when settled governments ruled between the mouths of the Irrawaddy and the China sea.

The third dye plant, *Marsdenia tinctoria*, R. Br., would seem to show a very different history. Its natural distribution is from the eastern Himalaya and southern China to Borneo and Java; but there is no history of its cultivation in northern India and China. It was first described at the end of the 18th century by William Marsden, who found it in western Sumatra and sent specimens to England when Robert Brown named the genus *Marsdenia* after him. It was brought to notice in Calcutta, and Roxburgh "warmly recommended an extensive cultivation" of it, after trying it in the East India Company's garden. But despite quite a considerable interest taken in it, which interest is very evident from the correspondence printed in the Journal of the Agri-Horticultural Society of India, no cultivation was taken up.

In 1844 it was shown that the Karens; and sometimes the Burmese of Lower Burma grow it: but it is said that they did not consider it the equal of *Strobilanthes flaccidifolius*. It appears to have been grown at one time in Java. Elsewhere it does not appear to have been a crop; and in no place so much a crop as in western Sumatra. Its cultivation therefore belongs to this part of the world in a greater measure than that of indigo and of *Strobilanthes flaccidifolius*.

Mr. Farrer describes the preparation of dye from *Strobilanthes* as done thus: the twigs are cut, steeped in water to which lime is added, the water beaten when fermentation has set in, and the precipitated dye subsequently collected. No oil is used, as Fortune says is in the tea districts of China.

I. H. BURKILL.

ANOTHER "WET ROT," AND PORIA HYPOBRUNNEA.

About eighteen months ago an old tree of *Spathodea campanulata* that had been blown over in the edge of the Gardens' Jungle within the Botanic Gardens, Singapore, was cut at three feet from the base, and the stump being left in the ground was allowed to coppice. Some dozen strong shoots shot up; but when about